INSTRUCTION MANUAL

MODEL 76A-03

PROGRAMMABLE DC BIAS OPTION

FOR THE

MODEL 76A AUTOMATIC CAPACITANCE BRIDGE

76A-03
1079

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SECTION I

INTRODUCTION

1.1 SCOPE OF MANUAL

1.2 This Instruction Manual provides descriptive data and operating instructions for the Model 76A-03 Programmable DC Bias Option. The parts list for this option is found in the 76A Instruction Manual. The 76A-03 is manufactured by Boonton Electronics Corporation, Parsippany, New Jersey

1.3 PURPOSE AND USE OF EQUIPMENT

1.4 The 76A-03 is a microprocessor-controlled, programmable (from the front panel of the 76A), DC Power Supply which generates precision, positive dc voltages which are applied internally to the HI TEST TERMINAL of the Model 76A.

1.5 PERFORMANCE SPECIFICATIONS

1.5.1 Front panel programmable voltage: from 0 to +200 volts dc in increments of 5 mV from 0 to 20 volts, and in increments of 50 mV from 20 volts to 200 volts.

1.5.2 Voltage tolerances: ±0.05% of reading ± 5 mV below 20 volts, and ±50 mV above 20 volts.

1.5.3 Maximum current: 10 mA, internally protected (by a 1/64 A fuse on the 76A-03 Option PC board).

1.5.4 Power requirements: Internally powered from the 76A main frame.

1.5.5 Operating temperature: 0 to 55°C.

SECTION II

OPERATION

2.1 GENERAL

2.2 This section contains instructions for the installation and operation of the Model 76A-03. It is recommended that the operator be familiar with the material in this section before attempting to operate the equipment; otherwise the full capability of this option may not be realized.

2.3 INSTALLATION

NOTE: If the option is already installed in a new 76A, proceed to Paragraph 2.6.

2.4 UNPACKING. The Model 76A-03 is shipped complete and ready for installation upon receipt. Unpack the PC board assembly from the shipping container and inspect it for damage which may have occurred during shipment. Check that all IC's are seated in their sockets.

NOTE: Save the packing material and container for possible use in reshipment of the equipment.

TABLE 2-1. ASSEMBLY PARTS LIST

ITEM	DESCRIPTION	QTY.
A	-03 Option PC Board	1
B	3M Flat Cable Assembly	1
C*	PROM 1702A #S3	1
D	Cable Ties	2

*Not needed if new type ROM PC board assembly (BEC #076-057) is installed.

CAUTION: HIGH VOLTAGE IS PRESENT ON THE -03 OPTION PC BOARD. THEREFORE DO NOT CONNECT THE -03 OPTION PC BOARD TO THE 76A WHILE THE 76A IS POWERED. DAMAGE TO THE OPTION PC BOARD, TO THE 76A ITSELF, AND TO THE INSTALLER COULD RESULT.

2.5 PROCEDURE

2.5.1 Remove the three screws holding the top cover of the Model 76A, and take off the cover.

NOTE: If the new type ROM PC Board Assembly is installed (BEC #076-057) proceed to Paragraph 2.5.5.

2.5.2 Pull out the ROM PC Board. It is the second plug-in PC board, counting from the back, on the right front side of the 76A.

2.5.3 Check that three top 1702A PROM's contain the letter "S" in their identification numbers (S0, S_b0, S_c0, S1, S2).

2.5.4 Plug in PROM S3 (supplied) into the empty socket next to S2 PROM with pin #1 on top.

2.5.5 Unpack the -03 Option PC Board. Unwind the cable connected to it. (It is the ac power connection to the power transformer for the high voltage supply).

2.5.6 Route the above cable underneath the PC boards along the right side of the 76A and underneath the heat sink of the horizontal power supply PC board up to the small (3 pin) Molex connector on the upper right side of the power transformer. Do not connect it yet.

2.5.7 Plug the end of the flat cable with the cable clamp on its connector into the PC board with the red strip toward the bottom, and plug the other end into the zero adjustment PC board lower DIP socket with the red strip still at the bottom.

2.5.8 Plug the option PC board into the second (from the front of the 76A) connector on the logic meter board, taking care not to pinch the power cable, and route this cable in front of the option PC board.

2.5.9 Plug the end of the power cable into the Molex connector mentioned previously, route it along the wall, and clamp it with the two cable ties supplied to the cable leading to the power switch in the space between the horizontal power supply PC board and the logic master PC board.

2.5.10 Check the position of the dc bias jumper at the back of the 76A. It should be connected between the internal and the external bias posts.

2.5.11 Connect the digital dc voltmeter to the internal and the ground terminals at the back of the 76A.

2.5.12 Power up the 76A, and switch it to the ENTER mode.

2.5.13 Enter zero dc bias voltage by pushing "0" and "BIAS ENTER" keys (voltage entered is read on the right side display).

2.5.14 Adjust the uppermost right trimmer on the option PC board to read 0 volt ± 1 mV on the dc voltmeter.

2.5.15 Enter 20 V (see Paragraphs 2.6.3 and 2.6.4) and observe the dc voltmeter. If the voltage is not 20 V, adjust the uppermost left trimmer to read 20 V.

2.5.16 Enter 200 V and adjust the middle trimmer, if necessary, to read 200 V.

NOTE: Since these two trimmers interact, check the zero and 20 V readings.

2.5.17 Check the bias voltage on the front TNC TEST connectors.

2.5.18 Replace the cover.

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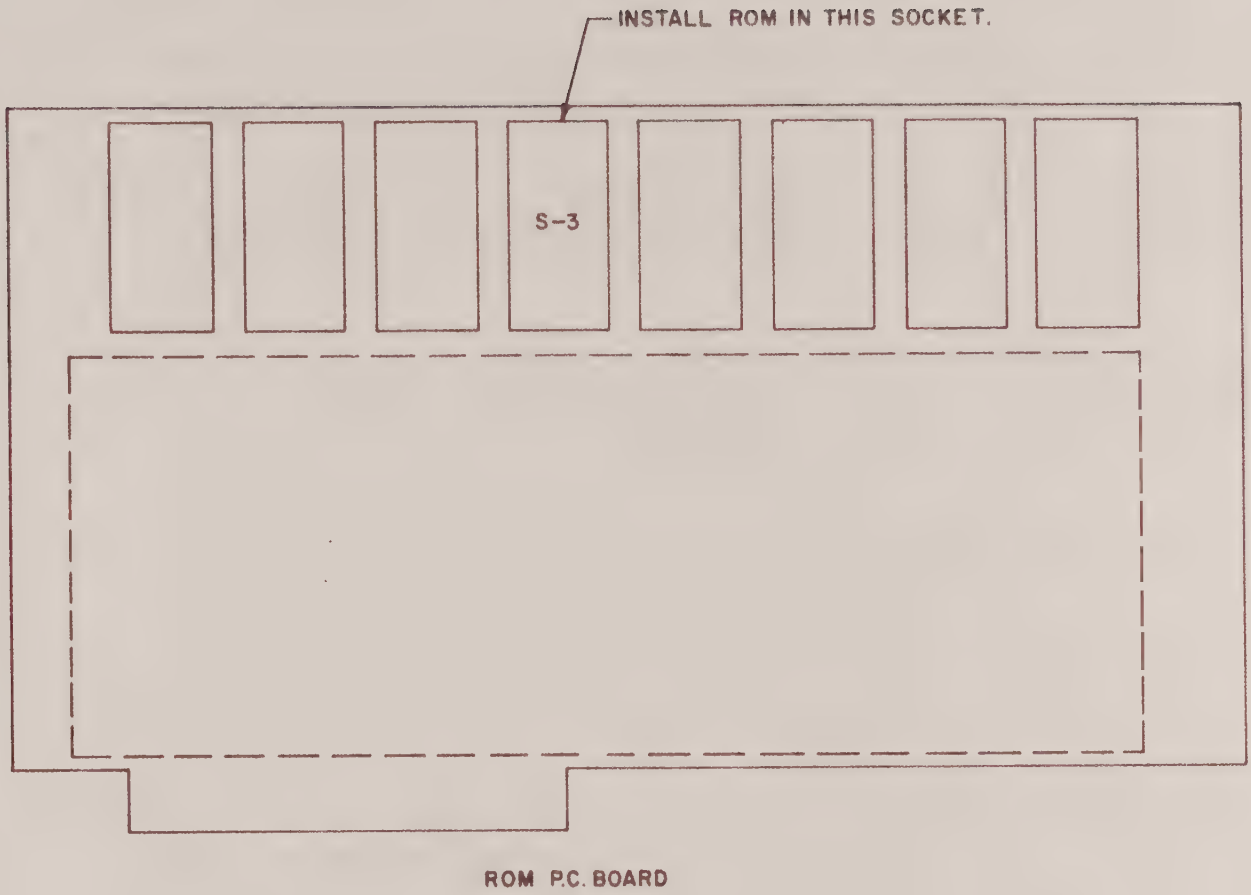

Figure 1. ROM PC BOARD

2.6 OPERATING INSTRUCTIONS

2.6.1 Check the position of the jumper at the back of the Model 76A. It should be connected between the EXTERNAL and the INTERNAL BIAS terminals.

2.6.2 Switch the Model 76A on, and after the initiation phase (relay exercise) is completed, switch the slide switch on the left side of the 76A to the ENTER position.

CAUTION: During the initiation phase, a dc voltage (less than 20 volts) can be present at the TEST TERMINALS. It will go to zero automatically after initialization is completed.

2.6.3 Enter the required voltage by pushing the keys on the front panel (numbers, as well as decimal point, are printed in red below the buttons).

2.6.4 Press the BIAS ENTER key to apply voltage to the TEST TERMINALS (entered voltage will be displayed on the right side digital readout).

2.6.5 Switch the slide switch back to MEASURE. Entered bias will remain unchanged until a new value is entered by the procedure above.

2.6.6 To return bias to zero, switch to the ENTRY mode, press the CLEAR key, and then press the BIAS ENTER key.

NOTE: Since the 12-bit binary D/A converter has a resolution of 5 mV on the 0 to 20 volts range and 50 mV on the 20 to 200 volts range, any attempt to enter voltage below this resolution will result in rounding of the voltage to the closest step. This rounded voltage will be shown on the display.

SECTION III

THEORY OF OPERATION

3.1 All circuits of the 76A-03 Option, with the exception of the power transformer, are located on the 76A-03 Option PC board.

3.2 Circuits of the 76A-03 Option, for the purpose of this discussion, may be grouped into five groups: Digital interface logic, latches (registers), D/A converter, voltage multiplier and output stage, and high voltage power supply.

3.3 The voltage entered at the front panel in the manner described in Paragraph 2.6 is stored in the RAM memory upon activating the BIAS ENTER key. This key also activates the logic circuits which transfer this value in binary code through IC4 to registers IC6, IC7, IC8, and range selector IC9 (Clear/resgisters first, enters range and value in 3 bytes, starting with MSB).

3.4 Outputs of registers (they act as latches) are connected to the D/A converter (IC10) inputs which has an output range of 0 to 10 volts.

3.5 Voltage at the output of the D/A converter is applied to the inverting input of the operational amplifier (A1) whose non-inverting input is connected to a feedback loop from the output of the bias power supply through the divider network R17, R18, R22, R16, R12, R13, and Q_3. Output at A1 is applied to the input of the output stage (Q_4 and Q_6).

3.6 If the programmed voltage is less than 20 volts, $\overline{Q}$ of IC9 is low, and as a result Q_3 is not conducting. A feedback voltage divider consisting of R17, R18, R22, and R16 is adjusted by means of R18 to a 1:2.048 ratio of output voltage, which will result in 20 volts output if all bits in the D/A converter are in.

3.7 If the voltage programmed is above 20 volts, $\overline{Q}$ of IC9 is high and Q_3 is conducting, and, as a result, a low resistance branch (R12 and R13) is connected across R16. This branch is adjusted by means of R13 to a 1:20.24 ratio, which will give 200 volts output if all bits at the input of the D/A converter are in.

3.8 Q_1 is used to pull down the D_o line on request from the CPU to signal presence of the 76A-03 Option in the connector.

3.9 The combination of resistor R27 and capacitor C12 at IC9 pin 4 is used to assure that the output of the bias power supply will be in its low range during the initiation phase of the Model 76A. (See the caution note after Paragraph 2.6.2.)

3.10 The power supply is a full-wave bridge, capacitor input supply, protected by a 1/64 A fuse (≈ 15 mA). It receives voltage from the power transformer through the cable from a Molex connector on the voltage selector cover.